

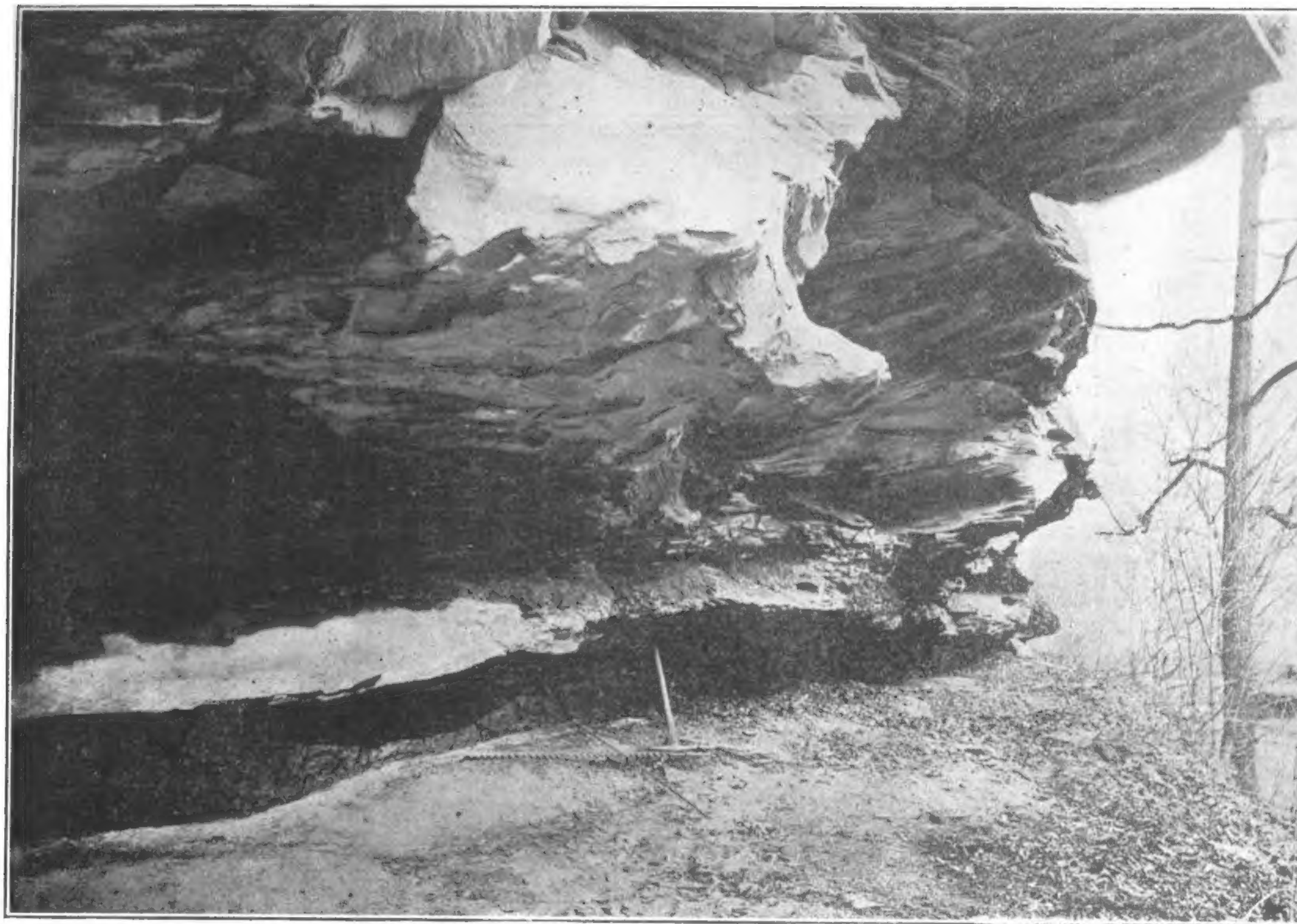
The
Kentucky Geological
Survey

WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST



SERIES SIX
VOLUME SIX

The Sixth
Geological Survey
1921



THE WHITESBURG COAL AND SANDSTONE "ROCKHOUSE" ROOF.

This characteristic view of the well known Whitesburg coal and its superimposed thirty feet of cliff forming sandstone may be seen on Otter Creek just above its juncture with the Middle Fork of the Kentucky River in Perry County.

THE SIXTH GEOLOGICAL SURVEY

An Administrative Report of the Several Mineral Resource
and General Geological Investigations Under-
taken and Completed in Kentucky
during the Biennial Period
1920-1921



By
WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

PRESENTED WITH TEN SEPARATE
MISCELLANEOUS GEOLOGICAL PAPERS

BY
GEORGE P. MERRILL,
STUART WELLS
WILLARD ROUSE JILLSON
STUART ST. CLAIR
AND
CHARLES STEVENS CROUSE

*Illustrated with 101 Photographs
Maps and Diagrams*

First Edition

1,000 Copies

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PREFACE

Applied geology is of great economic value to every State in which natural resources are only partly developed. This is especially true of Kentucky where the great body of mineral resources are now less than 20% under commercial operation. An ideal arrangement would be one where the State would have completed the base (topographic) mapping and the preliminary geological-resource surveys prior to the opening up of any oil, coal, natural gas, asphalt or other field. During the period of proving up such a field, State employed geologists could well work hand in hand with the operators, and assist them greatly in their efforts to win the resources desired.

Unfortunately this ideal arrangement has never existed in Kentucky, though it has to some extent in other States. With only 46% of Kentucky base (topographic) mapped, and with an area approximating that of sixty counties not covered by any accurate maps at all, the function of the Kentucky Geological Survey has always been crippled and held in restraint. The day of a 100% efficiency of the Kentucky Geological Survey seems yet to be in the distant future.

During the last biennium a large number of subjects of great economic value to this State have been investigated, however, by the Kentucky Geological Survey. A full account of these investigations is presented herewith in the first paper of this volume entitled, "The Sixth Geological Survey." A number of these economic papers are included within the covers of this book, and should assist materially in an understanding of the geology and resources of the several regions covered. This report is issued in an original edition of one thousand copies.



Director and State Geologist.

Old Capitol,
Frankfort, Kentucky.
December 15, 1921.

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THE SIXTH
GEOLOGICAL SURVEY

V

A NEW METHOD OF PRODUCING CRUDE OIL IN KENTUCKY.

BY WILLARD ROUSE JILLSON,
Director and State Geologist.

Within the last year experimental work has been undertaken at Ravenna, Estill County, Kentucky, looking towards the production of crude oil in commercial quantities by an entirely different method than any which has heretofore been used in this State. The process as already developed and projected is probably new, also, for the entire United States, though the Union Oil Co. of California has been experimenting in a somewhat similar way with a tunnel driven into Sulphur Mountain in Ventura County, California.¹ Similar methods have been used in certain parts of Europe, notably Alsace.² The Estill County method involved consists of the sinking of a shaft 8 by 12 feet to a depth of 130 feet through the Devonian black (Chattanooga) shale to the underlying oil "sand," the Onondaga (Corniferous) limestone. This work has progressed satisfactorily to date, the shaft having been sunk close to an old producing oil well on the Hudson farm within the confines of Ravenna townsite.

This preliminary work because of its exploratory nature has necessarily been carried on much slower than might otherwise have been expected. Notwithstanding the difficulties attending, however, the shaft has been sunk into the oil "sand," and oil has actually been produced from the Onondaga limestone in quantities that have averaged about two or three barrels a day. This amount of crude oil production does not, of course, justify the expenditure necessary to sink a shaft of the size indicated; but the present production is regarded as only an incident to the development of this property, which was suspended at this

¹Bulletin of the Union Oil Co. of Calif., Vol. 1, pp. 5-8, Aug., 1921.

²M. Paul de Chambrier, Eng. and Mining Jour., Vol. 112, p. 103, July 16, 1921.



STOCKADE ENCLOSING "OIL MINE."

In the foreground is the shaft enclosed by a stockade. On the hill in the background is a small oil tank used in working this "Oil Mine." The fill in the foreground is principally made of Black (Devonian) Shale which was removed in construction of the shaft.

point awaiting the installation of larger machinery. It is further the plan of the operators, Mr. D. W. R. Kinney, George W. Easton and John McMinn, to drift out into the oil "sand" a triangular tunnel 6 feet high and 7 feet at the base to a distance of one thousand feet in a northeasterly direction from the main shaft. This prospecting tunnel will drive slightly upwards as it goes forward with the result, which is outlined, that oil will be produced into it and find its way by gravity to a sump at the base of the main shaft, where it is proposed to take it out by pumping.

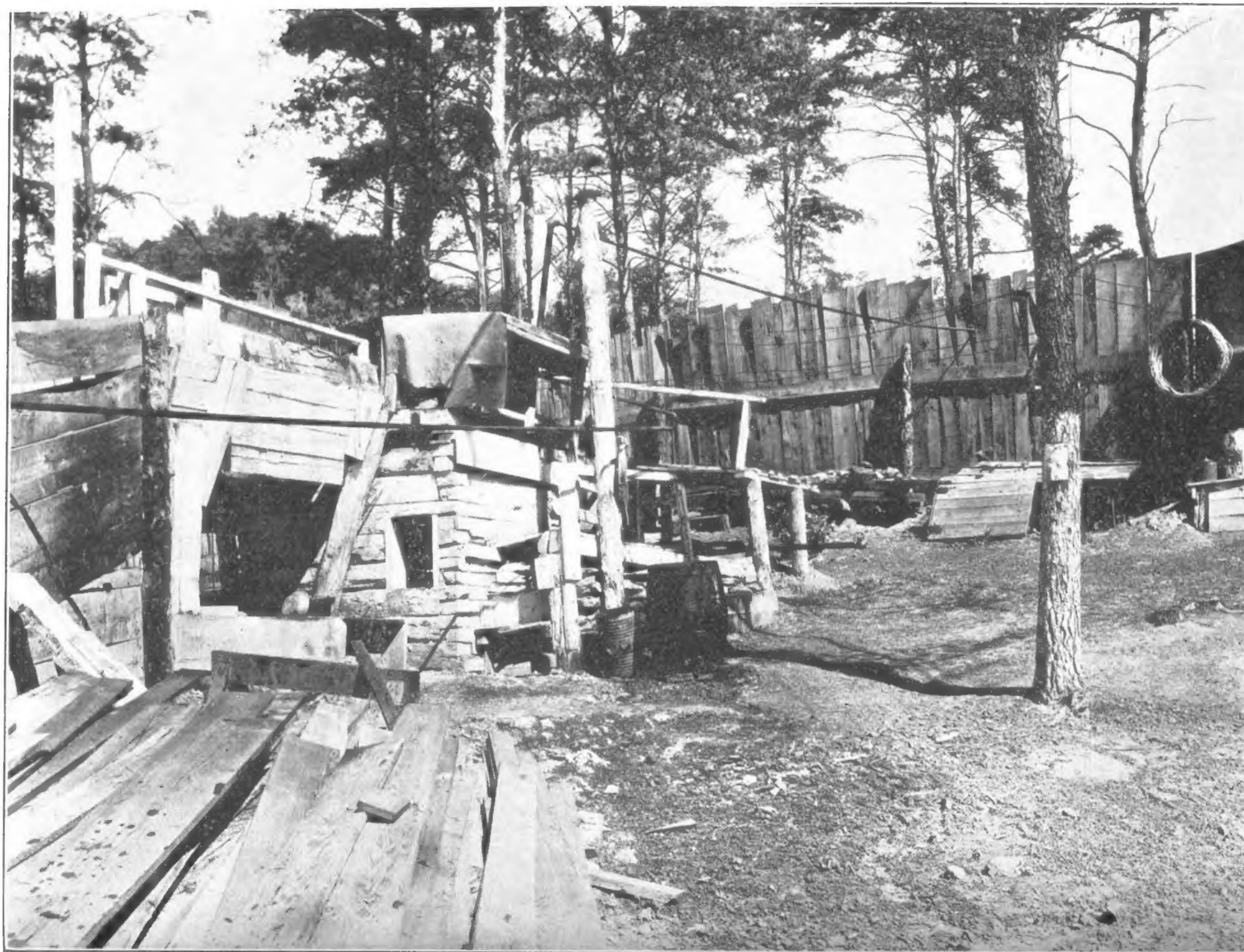
It is the plan of the operators to enlarge the base of the shaft into a room 12 feet square and 7 feet high. It is proposed further to retort on the ground the oil impregnated limestone or "sand" cut from the 1,000-foot tunnel. The oil "sand" it is claimed carries as much as 25% by volume of crude oil. This fraction is regarded as high, although the actual figure is not known. Investigations made in the mining laboratory of the University of Kentucky indicate that this limestone of Devon-

ian age when excavated may contain and produce under proper methods upwards of from between 5 and 10 gallons per short ton. It has been shown that after the firing and retorting the limestone may be used as an excellent fertilizer, and sold it is stated at about \$3.00 per ton.

The work of excavation at Ravenna to date has been done by McMinn under the direction of D. W. R. Kinney. It is stated that provisional to a recent reorganization of this operation Frank W. Armstrong and associates of Chicago, Ill., will take up the further development of this property, drive the new experimental tunnel and operate it in close proximity to the main shaft. In conjunction with the retorting of the oil "sand" it is also proposed to retort the Chattanooga black shale (Devonian) which occurs on his property. The productivity of the "oil" shale in this locality has already been made the subject of investigation, the results of which have been published.¹

The practicality of this method of "oil mining" remains to be proven. The work up to the present has been little more than a novelty experiment, which has shown that oil can be produced from an open shaft. Whether commercial quantities can be produced from an open shaft or from tunnels drifted out into the oil "sand" from this shaft remains to be seen. The feasibility of retorting excavated oil "sand" to recover oil, even with the possibility of using the fired "sand" as a limestone fertilizer in a section of reasonable market, is another experiment. It is recognized that while crude oils produced, even in small quantities, from an oil mine of this character might make the venture a paying one in times of high price crudes, it must also be pointed out that it will be the sluggish or subnormal oil market that this new industry must necessarily be prepared to meet. This will be true of such projects as this, even more so than the oil producing (drilling) industry, because of the larger investment made necessary by the first and the relatively smaller investment made necessary by the latter.

¹A Preliminary Report on the Oil Shales of Kentucky, W. R. Jillson, Economic Papers on Ky. Geology, p. 1, Ky. Geol. Survey, Series VI, Vol. II, 1921.



THE KINNEY "OIL MINE" SHAFT.

This property is located in Ravenna, Batall County and has produced considerable amount of oil.



DETAIL OF THE ONONDAGA LIMESTONE.

Here are shown in excellent relief the cherty "hornstone" inclusions and the soft shelly (fossiliferous) horizon in the center (see hammer). The thickness of the "Corniferous" at this point near Irvine, Ky., is 10 feet.

As a scientific experiment the Ravenna oil mine is indeed really worth while, and oil men generally will find much interest in going there and in getting down in to the oil "sand." At the base of this experimental shaft it is quite possible to see under what conditions crude oil is produced out of the Onondaga (Corniferous) limestone. Many new notions concerning the porosity of "sands" will be found there waiting the earnest investigator. One of the things which will strike him as of more than ordinary importance is the fact that the oil is produced into the base of the shaft not throughout the entire thickness of the oil "sand," but through a fraction of the entire thickness, and there from crevices or fractures back into "sand." At the present time many rather large blocks of the oil "sand" (limestone) may be taken from the producing strata for experimental

study. It has been found that frequently when such blocks of the "sand" (limestone) are shattered the newly exposed faces will show that because of its compactness, much of the limestone never did contain any oil. While the opening in the "sand" (limestone) today is rather restricted, sufficient surface of the oil producing strata is available to afford rather extended studies. Exposures of the dry gray green and white shales below the black (Chattanooga) shale and above the Onondaga limestone may also be examined sufficiently to convince any one of the fact that the crude oil which is now being produced from the Onondaga limestone below never came down through it from the Devonian black (Chattanooga) shale above.

